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NEIL A. DUCHEZ (VELOCYS)
RENNER, OTTO, BOISSELLE & SKLAR, LLP
1621 EUCLID AVENUE
19TH FLOOR
CLEVELAND, OH 44115

EXAMINER	
WARTALOWICZ, PAUL A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/777,033	TONKOVICH ET AL.	
	Examiner	Art Unit	
	PAUL A. WARTALOWICZ	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 June 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-78* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-78* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 6/2/9 have been fully considered but they are not persuasive.

Applicant argues that the 90% conversion for each reactor is a mischaracterization of the teachings of TeGrotenhuis and that this does not meet the limitation of 90% approach to equilibrium.

However, it appears that a 90% conversion rate overlaps with a 90% approach to equilibrium. It appears that a 100% approach to equilibrium would be about 50% conversion as an approach to equilibrium would equate to roughly half of the reactants being consumed. As TeGrotenhuis teaches that the processes have generally a 90% conversion rate, it appears that this would be equivalent to a approach to equilibrium of close to 100% and therefore overlaps with the range in the claims. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. MPEP 2144.05 (I).

Applicant argues that Reyes contains no disclosure relating to determining the equilibrium conversion value for a reactant and conducting the reaction in a microchannel.

However, Reyes is not relied upon to teach the limitation of determining the equilibrium conversion value for a reactant and conducting the reaction in a microchannel. In response to applicant's arguments against the references individually,

one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Additionally, one of ordinary skill would have looked to Reyes as both TeGrotenhuis and Reyes are drawn to the method of partial oxidation as indicated in the rejections, *infra*.

In response to applicant's argument that Reyes is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, the prior art reference is in the field of applicant's endeavor, namely partial oxidation.

Applicant argues that Schmidt does not disclose conducting the microchannel comprising at least one process microchannel and that these zones are separated by a non-reactive zone not containing catalyst.

However, Schmidt is not relied upon to teach the limitation of determining the equilibrium conversion value for a reactant and conducting the reaction in a microchannel. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413,

208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Additionally, one of ordinary skill would have looked to Schmidt as both TeGrotenhuis and Reyes are drawn to the method of partial oxidation as indicated in the rejections, *infra*.

In response to applicant's argument that Reyes is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, the prior art reference is in the field of applicant's endeavor, namely partial oxidation.

Applicant argues that Shikada teaches synthesis in a medium oil, not the method of Applicants wherein the reaction is conducted in a microchannel, a first reaction being conducted in a microchannel and another reaction being conducted in another reaction zone in the same microchannel.

However, Shikada teaches several embodiments, one of which does not appear to use medium oil (col. 35-36). Additionally, one of ordinary skill in the art would have looked to Shikada for a method of performing dimethyl ether synthesis in TeGrotenhuis as it is known to produce dimethyl ether in a microreactor as taught by Liu as described in the rejection, *infra*.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-59, 62-64, 68-72, 75-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over TeGrotenhuis et al. (WO 03/078052) in view of Reyes (6726850) and Tonkovich (6200536).

TeGrotenhuis teach a process for oxidation (page 27) wherein the reactions are equilibrated to 90% conversion (page 13) and wherein sequential reactors, having ribs formed of catalysts (fig. 10, #164), are used in the process (page 26) wherein the multiple microchanels have temperatures around 300°C (page 31).. TeGrotenhuis additionally teach or suggest limitations including another reaction temperature in a second step is lower than the reaction temperature in a first step (page 13), thee

dimensions of the microchannel (page 9), counter-current relationship of fluid of microchannel with heat-exchange channel (page 15).

TeGrotenhuis fail to teach that an intermediate is formed in a first reaction zone with a first catalyst and a final product is formed in a second reaction zone.

Reyes teach a multistage process (col. 1) wherein multiple stages are carried out wherein the intermediate product is transported to the next stage wherein all the stages comprise a partial oxidation catalyst (col. 3-4)

It would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide wherein an intermediate is formed in a first reaction zone with a first catalyst and a final product is formed in a second reaction zone in TeGrotenhuis because both documents are drawn to the substantially similar method of methanol synthesis (O'Rear, col. 5) or partial oxidation (Reyes, col. 3-4) as taught by Reyes.

TeGrotenhuis fails to teach the reaction zones are separated by a non-reactive zone, the first reaction zone and another reaction zone being in the same process microchannel.

Tonkovich teach a microchannel reactor configuration (col. 1) wherein a heat exchanger is disposed between two reactors within a singular process microchannel (fig. 2d, col. 4).

It would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide heat exchangers is disposed between two

reactors in TeGrotenhuis in order to provide an apparatus for substantially similar processes as taught by Tonkovich.

Additionally, it appears that Tonkovich is silent with respect to whether there is catalyst in the heat exchanger chamber (fig. 2d, 220). However, catalyst is sometimes added to exothermic chamber (100). One of ordinary skill in the art at the time applicant's invention was made would recognize that there is no catalyst present in the heat exchanger zone of Tonkovich because a catalyst coating is only mentioned regarding the exothermic chamber.

Additionally, it would have been obvious to incorporate these singular elements into an integral reactor. *In re Larson*, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. MPEP 2144.05.

As to claims 75-77, it appears that the prior art teach a substantially similar process as that of the claimed invention such that the properties of the prior art are substantially similar to that of the claimed invention including SLPM and contact time of the reactants.

It appears that a 100% approach to equilibrium would be about 50% conversion as an approach to equilibrium would equate to roughly half of the reactants being consumed. As TeGrotenhuis teaches that the processes have generally a 90% conversion rate, it appears that this would be equivalent to a approach to equilibrium of

close to 100% and therefore overlaps with the range in the claims. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. MPEP 2144.05 (I).

Regarding claims 52 and 53, Reyes teaches that alumina is a well known support for catalysts (col. 5).

Therefore, it would have been obvious to make the ribs of TeGrotenhuis out of alumina in order to provide a well known support for catalysts as taught by Reyes

Claims 60, 61, 65, 66, 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over TeGrotenhuis et al. (WO 03/078052) in view of Reyes (6726850) and Tonkovich (6200536) and Wainwright (4366260).

TeGrotenhuis teaches a process as described above in claim 1.

TeGrotenhuis fails to teach limitations including reaction time and pressure.

TeGrotenhuis teaches a methanol synthesis reaction (page 27).

Additionally, Wainwright teach that it is known that using specific catalysts are capable of producing both methanol ether depending on conditions of reactions such as contact time and pressure (col. 6-7).

Therefore, it would have been obvious to vary conditions such as contact time and pressure in TeGrotenhuis in order to produce the desired end product such as methanol and (col. 6-7) as taught by Wainwright.

The claimed values for pressure and contact time would overlap with the values for pressure and contact time discovered through routine experimentation. In the case

where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. MPEP 2144.05 (I)

Claim 73 is rejected under 35 U.S.C. 103(a) as being unpatentable over TeGrotenhuis et al. (WO 03/078052) in view of Reyes (6726850) and Tonkovich (6200536) and Wentworth (US 4235799).

TeGrotenhuis teach a process for methanol synthesis (page 27) wherein the reactions are equilibrated to 90% conversion (page 13) and wherein sequential reactors are used in the process (page 26) wherein the multiple microchanels have temperatures around 300°C (page 31).. TeGrotenhuis additionally teach or suggest limitations including another reaction temperature in a second step is lower than the reaction temperature in a first step (page 13), thee dimensions of the microchannel (page 9), counter-current relationship of fluid of microchannel with heat-exchange channel (page 15).

TeGrotenhuis fails to teach flowing the reactant composition through a first reaction zone to produce an intermediate product comprising primary reactant and methanol, thereafter flowing the intermediate product to a second reaction zone to form methanol.

Wentworth teaches a method of making methanol (col. 1) wherein a reactant composition is passed through multiple catalyst reactions for the purpose of minimizing the amount of heat exchange required to heat the inlet gas to a temperature appropriate for the synthesis reaction to initiate (col. 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to flow reactant through multiple catalyst reactions in TeGrotenhuis in order to minimize the amount of heat exchange required to heat the inlet gas to a temperature appropriate for the synthesis reaction to initiate (col. 2) as taught by Wentworth.

Additionally, Wentworth teaches a heat exchanger between two catalytic reactors for the purpose of heating the stream 129 before entering catalytic reactor 117 (fig. 1, #115, 127, 129, 117, col. 9).

Additionally, it would have been obvious to incorporate these singular elements into an integral reactor. *In re Larson*, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. MPEP 2144.05.

It appears that a 100% approach to equilibrium would be about 50% conversion as an approach to equilibrium would equate to roughly half of the reactants being consumed. As TeGrotenhuis teaches that the processes have generally a 90% conversion rate, it appears that this would be equivalent to a approach to equilibrium of close to 100% and therefore overlaps with the range in the claims. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. MPEP 2144.05 (I).

Claim 74 is rejected under 35 U.S.C. 103(a) as being unpatentable over TeGrotenhuis (WO 03/078052) in view of Liu et al. ("Selective One-Step…") and Shikada (6562306).

TeGrotenhuis teaches a process for methanol synthesis (page 27) wherein the reactions are equilibrated to 90% conversion (page 13) and wherein sequential reactors are used in the process (page 26). TeGrotenhuis additionally teach or suggest limitations including another reaction temperature in a second step is lower than the reaction temperature in a first step (page 13), thee dimensions of the microchannel (page 9), counter-current relationship of fluid of microchannel with heat-exchange channel (page 15).

TeGrotenhuis fail to teach that an intermediate is formed in a first reaction zone with a first catalyst and a final product is formed in a second reaction zone.

TeGrotenhuis fail to teach that an intermediate is formed in a first reaction zone with a first catalyst and a final product is formed in a second reaction zone

TeGrotenhuis fail to teach a method of making dimethyl ether.

TeGrotenhuis teach a method of carrying out exothermic reactions (page 27).

Liu teaches that it is known to produce dimethyl ether in a microreactor (page 10841).

Shikada teach a method of making dimethyl ether (col. 1) wherein carbon monoxide and hydrogen are flowed through a two reactor process wherein dimethyl ether and intermediate is formed in a first reactor having a first catalyst and dimethyl ether product is formed in a second reactor having a second catalyst (col.35-36).

As TeGrotenhuis teaches an apparatus capable of carrying out exothermic reactions, Liu teaches that it is known to produce dimethyl ether in a microreactor (page 10841) and Shikada teaches that carbon monoxide and hydrogen are flowed through a two reactor process wherein dimethyl ether and intermediate is formed in a first reactor having a first catalyst and dimethyl ether product is formed in a second reactor having a second catalyst (col.35-36), it would have been obvious to one of ordinary skill in the art to flow carbon monoxide and hydrogen through multiple microreactors of TeGrotenhis in order to form dimethyl ether and intermediate in a first reactor having a first catalyst and dimethyl ether product in a second reactor having a second catalyst.

Additionally, it would have been obvious to incorporate these singular elements into an integral reactor. *In re Larson*, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965) (A claim to a fluid transporting vehicle was rejected as obvious over a prior art reference which differed from the prior art in claiming a brake drum integral with a clamping means, whereas the brake disc and clamp of the prior art comprise several parts rigidly secured together as a single unit. MPEP 2144.05.

It appears that a 100% approach to equilibrium would be about 50% conversion as an approach to equilibrium would equate to roughly half of the reactants being consumed. As TeGrotenhuis teaches that the processes have generally a 90% conversion rate, it appears that this would be equivalent to a approach to equilibrium of close to 100% and therefore overlaps with the range in the claims. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. MPEP 2144.05 (I).

Claims 75-77 are rejected under 35 U.S.C. 103(a) as being unpatentable over TeGrotenhuis et al. (WO 03/078052) in view of Reyes (6726850) and Tonkovich (6200536) and Schmidt (U.S. 6452061)

TeGrotenhuis teach a method as described above.

If TeGrotenhuis fails to teach the limitations of claims 75-77, Schmidt teaches a method of oxidation of hydrocarbons (col. 1) wherein the claimed SLPM and contact time is known for conversion reactions (col. 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the claimed SLPM and contact time in TeGrotenhuis because these reaction conditions are well known as taught by Tonkovich and Schmidt.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAUL A. WARTALOWICZ whose telephone number is (571)272-5957. The examiner can normally be reached on 8:30-6 M-Th and 8:30-5 on Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Paul Wartalowicz
October 12, 2009

/Stanley Silverman/
Supervisory Patent Examiner, AU 1793